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EXAMINER

GOLDEN, JAMES R

ART UNIT	PAPER NUMBER
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2187

DATE MAILED: 05/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/798,962	Applicant(s) COCHRAN ET AL.	
	Examiner James Golden	Art Unit 2187	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on _____ is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

The instant application 10/798962 has a total of 33 claims pending. There are 8 independent claims and 25 dependent claims. Claims 1-33 have been rejected in view of prior art.

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The title --Data Synchronization for Data Mirrors With Sidefiles-- is suggested.

Claim Objections

2. **Claims 5-12** are objected to because of the following informalities: claims 5-12 recite the limitation "The data synchronization arrangement" in line 1. There is insufficient antecedent basis for this limitation in the claim. These objections could be overcome by correcting line 1 of claims 5-12 to --The data synchronization method--.
3. **Claim 7** is objected to because of the following informalities: "based upon the writes are stored" (line 2) should be corrected to --based upon the writes that are stored--.
4. **Claims 14-27** are objected to because of the following informalities: claims 5-12 recite the limitation "The data synchronization arrangement" in line 1. There is insufficient antecedent basis for this limitation in the claim. These objections could be overcome by correcting line 1 of claims 5-12 to --The redundant storage arrangement--.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. **Claims 1-4, 6, 13-17, 19 and 26-33** are rejected under 35 U.S.C. 102(e) as being anticipated by Iwamura et al. (US 2005/0038968).

7. **With respect to claim 1**, Iwamura et al. disclose a data synchronization method for a redundant data storage arrangement in which there are at least

- a primary storage entity (100 of Figs. 1 and 19; paragraph 0040, lines 1-2) and
- mirroring first (170 of Figs. 1 and 19; paragraph 0040, line 2) and second (180 of Figs. 1 and 19; paragraph 0040, lines 2-3) remote storage entities in communication therewith (160 of Fig. 1, arrows indicating communication of Fig. 19; paragraph 0040, lines 3-4, paragraphs 0064 and 0237 describe the synchronous link between host and synchronous site; paragraph 0238 describes communication between host and asynchronous site), respectively,
- writes to the first and second remote storage entities being tracked via respective first (CL1904 of Figs. 19 and 20) and second (DL1906 of Figs. 19 and 20) sidefiles (paragraph 0245),

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- the first and second storage entities having different levels of write-currency relative to each other (**paragraph 0237 describes synchronous link between host and synchronous site; paragraph 0238 describes asynchronous link between host and asynchronous site using a “DB log transmission program”**),

the method comprising:

- comparing the first sidefile with the second sidefile (**paragraph 0261, lines 3-7**); and
- updating writes stored at the second remote storage entity based upon the comparison of the first and second sidefiles (**paragraph 0261, lines 3-7**).

8. **With respect to claim 2**, Iwamura et al. disclose the method of claim 1 (see above paragraph 7) wherein the updating of writes includes forwarding to the second remote storage entity writes that are present in the first sidefile but not yet present in the second sidefile (**paragraph 0261**).

9. **With respect to claim 3**, Iwamura et al. disclose the method of claim 1 (see above paragraph 7) wherein the comparing is done on the basis of sequence numbers associated with the writes (**paragraph 0236 and paragraph 0261, lines 7-12**).

10. **With respect to claim 4**, Iwamura et al. disclose the method of claim 1 (see above paragraph 7), further comprising:

- establishing a communication connection between the first and second remote storage entities in response to the primary storage entity becoming inoperative

(paragraphs 0244, 0251; when the primary site fails, the synchronous site updates the asynchronous site);

- wherein the comparing and updating are also performed in response to the primary storage entity becoming inoperative **(paragraphs 0255-0266 describe updating process in response to failure, and paragraph 0261, lines 1-7 details comparing and updating).**

11. **With respect to claim 6**, Iwamura et al. disclose the data synchronization arrangement of claim 1 (see above paragraph 7), further comprising: adaptively adjusting the number of writes that can be stored in the first sidefile **(paragraph 0266, lines 6-11; a copy of the extensible log file is kept in the synchronous site).**

12. **With respect to claim 13**, Iwamura et al. disclose a redundant data storage arrangement comprising:

- a primary storage entity **(100 of Figs. 1 and 19; paragraph 0040, lines 1-2)** to forward writes to each of a mirroring first and second remote storage entity **(paragraphs 0237-0238);**
- the mirroring first remote storage entity **(170 of Figs. 1 and 19; paragraph 0040, line 2)**, in communication with the primary storage entity **(160 of Fig. 1, arrows indicating communication of Fig. 19; paragraph 0040, lines 3-4, paragraph 0237 describes the synchronous link between host and synchronous site)**, which includes a first sidefile **(CL1904 of Figs. 19 and 20)** via which writes forwarded from the primary storage entity are tracked **(paragraph 0245); and**

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- the mirroring second remote storage entity (**180 of Figs. 1 and 19; paragraph 0040, lines 2-3**), in communication with the primary storage entity (**160 of Fig. 1, arrows indicating communication of Fig. 19; paragraph 0040, lines 3-4; paragraph 0238 describes communication between host and asynchronous site**), which includes a second sidefile (**DL1906 of Figs. 19 and 20**) via which writes forwarded from the primary storage are tracked (**paragraph 0245**);
- the first and second storage entities having different levels of write-currency relative to each other (**paragraphs 0064 and 0237 describes synchronous link between host and synchronous site; paragraph 0238 describes asynchronous link between host and asynchronous site using a “DB log transmission program”**);
- an initiating one of the first and second remote storage entities being operable to
 - compare the first and second sidefiles (**paragraph 0261, lines 3-7**), and
 - invoke an updating of writes stored at the second remote storage entity based upon the comparison of the first and second sidefiles (**paragraph 0261, lines 3-7**).

13. **With respect to claim 14**, Iwamura et al. disclose the data synchronization arrangement of claim 13 (see above paragraph 12), wherein the updating is performed by the first remote storage entity, which is operable to do so by forwarding to the second remote storage entity writes that are present in the first sidefile but not yet present in the second sidefile (**paragraph 0261**).

14. **With respect to claim 15**, Iwamura et al. disclose the data synchronization arrangement of claim 13 (see above paragraph 12), wherein each of the first and second remote storage entities is operable to

- preserve in the respective sidefile sequence numbers associated with the writes **(paragraph 0246)**; and
- sort the respective sidefile according to the sequence numbers **(paragraph 0261, lines 1-7)**.

15. **With respect to claim 16**, Iwamura et al. disclose the data synchronization arrangement of claim 13 (see above paragraph 12), wherein:

- the initiating one is further operable to establish a communication connection between itself and the other remote storage entity in response to the primary storage entity becoming inoperative **(paragraphs 0244, 0251; when the primary site fails, the synchronous site updates the asynchronous site)**; and
- the comparison and the update are performed in response to the primary storage entity becoming inoperative **(paragraphs 0255-0266 describe updating process in response to failure, and paragraph 0261, lines 1-7 details comparing and updating)**.

16. **With respect to claim 17**, Iwamura et al. disclose the data synchronization arrangement of claim 13 (see above paragraph 12), wherein the first remote storage entity is closer in proximity to the primary storage entity than the second remote storage entity **(paragraph 0042, lines 5-8)**.

17. **With respect to claim 19**, Iwamura et al. disclose the data synchronization arrangement of claim 13 (see above paragraph 12), wherein: the first remote storage entity is operable to adaptively adjust the number of writes that can be stored in the first sidefile (**paragraph 0266, lines 6-11; a copy of the extensible log file is kept in the synchronous site**).
18. **With respect to claim 26**, Iwamura et al. disclose the data synchronization arrangement of claim 13 (see above paragraph 12), wherein each of the first and second remote storage entities represents a tracked write in the first and second sidefile (**paragraph 0058**), respectively, with: location information as to where on a physical medium the write is to be performed (**paragraph 0076, lines 1-5**); actual data associated with the write that is to be written to the physical medium (**paragraph 0265, lines 1-7**); and a sequence number uniquely associated with the write (**paragraph 0076, lines 7-13, paragraph 0265, lines 1-7**).
19. **With respect to claim 27**, Iwamura et al. disclose the data synchronization arrangement of claim 13 (see above paragraph 12), wherein the first remote storage entity receives writes forwarded synchronously from the primary storage entity (**paragraph 0237 describes the synchronous link between host and synchronous site**); and the second remote storage entity receives writes forwarded asynchronously from the primary storage entity (**paragraph 0238 describes communication between host and asynchronous site**).
20. **With respect to claim 28**, Iwamura et al. disclose a data synchronization method for a redundant data storage arrangement in which there are at least

a primary storage entity (100 of Figs. 1 and 19; paragraph 0040, lines 1-2) and mirroring first (170 of Figs. 1 and 19; paragraph 0040, line 2) and second (180 of Figs. 1 and 19; paragraph 0040, lines 2-3) remote storage entities in communication therewith (160 of Fig. 1, arrows indicating communication of Fig. 19; paragraph 0040, lines 3-4, paragraph 0237 describes the synchronous link between host and synchronous site; paragraph 0238 describes communication between host and asynchronous site), respectively, the method comprising:

- synchronously receiving writes at the first remote storage entity that have been forwarded from the primary storage entity (paragraph 0237 describes the synchronous link between host and synchronous site); and
- maintaining a sidefile (CL1904 of Figs. 19 and 20) via which are tracked items that include
 - writes received at the first remote storage entity (paragraph 0245), and
 - writes received at the second remote storage entity (paragraph 0245).

21. **With respect to claim 29**, Iwamura et al. disclose a mirroring first remote storage entity for a redundant data storage arrangement in which there are at least the first remote storage entity (170 of Figs. 1 and 19; paragraph 0040, line 2) and a primary storage entity (100 of Figs. 1 and 19; paragraph 0040, lines 1-2) in communication therewith (160 of Fig. 1, arrows indicating communication of Fig. 19; paragraph 0040, lines 3-4, paragraph 0237 describes the synchronous link between host and synchronous site), and a mirroring second remote storage entity (180 of Figs. 1 and 19; paragraph 0040, lines 2-3) in communication with the primary

storage entity (160 of Fig. 1, arrows indicating communication of Fig. 19; paragraph 0238 describes communication between host and asynchronous site), respectively, the first remote storage entity comprising:

- memory to store data (1903 and 1904 of Fig. 19; paragraph 0237, *note*: elements are mislabeled as 1093 and 1094); and
- a processor (paragraph 0084 describes how a CPU executes programs stored in subsystems, so therefore synchronous site 170 has a CPU) operable to
 - synchronously receive writes that have been forwarded from the primary storage entity (paragraphs 0064 and 0237); and
 - maintain a sidefile (1904 of Figs. 19 and 20) in the memory via which are tracked items that include
 - writes received at the first remote storage entity (paragraph 0245), and
 - writes received at the second remote storage entity (paragraph 0261, lines 1-7).

22. With respect to claim 30, Iwamura et al. disclose a data synchronization method for a redundant data storage arrangement in which there a primary storage entity (100 of Figs. 1, 19, and 22; paragraph 0040, lines 1-2) and mirroring first (170 of Figs. 1, 19 and 22; paragraph 0040, line 2) and second (180 of Figs. 1, 19 and 22; paragraph 0040, lines 2-3) remote storage entities in communication therewith (160 of Fig. 1, arrows indicating communication of Fig. 19; paragraph 0040, lines 3-4,

paragraph 0237 describes the synchronous link between host and synchronous site; paragraph 0238 describes communication between host and asynchronous site), respectively, the method comprising:

- **synchronously forwarding to the first remote storage entity writes from the primary storage entity (paragraphs 0064 and 0237); and**
- **informing the first remote storage entity regarding writes acknowledged to have been received at the second remote storage entity (paragraph 0270, a write completion message is stored in journal file system 2202 after a write to the asynchronous site 180; paragraph 0266, lines 6-11, a copy of the journal file system 2202 is kept in the synchronous site 170).**

23. **With respect to claim 31**, Iwamura et al. disclose a primary storage entity for a redundant data storage arrangement in which there are at least the primary storage entity and mirroring first and second remote storage entities in communication therewith, respectively, the primary storage entity comprising:

- **memory to store data (225A of Figs. 2, 19 and 22; paragraph 0265, lines 1-6); and**
- **a processor (111 of Fig. 1; paragraph 0047, line 1) operable to**
 - **synchronously forward writes to the first remote storage entity (paragraphs 0064 and 0237);**
 - **receive indications of writes acknowledged to have been received at the second remote storage entity (paragraph 0270, a write completion**

message is stored in journal file system 2202 after a write to the asynchronous site 180); and

- **inform the first remote storage entity regarding the indications (paragraph 0266, lines 6-11, a copy of the journal file system 2202 is kept in the synchronous site 170).**

24. **With respect to claim 32**, Iwamura et al. disclose a redundant data storage arrangement comprising:

- **primary storage means (125 of Fig. 1) for storing writes received from a host (paragraph 0052);**
- **first remote mirror means for mirroring writes forwarded from the primary storage means (170 of Figs. 1, 19 and 22; paragraph 0040, line 2) and for tracking such writes via a first sidefile (CL1904 of Figs. 19 and 20; paragraph 0245); and**
- **second remote mirror means for mirroring writes forwarded from the primary storage means (180 of Figs. 1, 19 and 22; paragraph 0040, lines 2-3) and for tracking writes such writes via a second sidefile (DL1906 of Figs. 19 and 20; paragraph 0245);**
- **the first and second storage entities having different levels of write-currency relative to each other (paragraphs 0064 and 0237 describes synchronous link between host and synchronous site; paragraph 0238 describes communication between host and asynchronous site using a “DB log transmission program”);**

- comparison means, responsive to the primary storage means being rendered inoperative, for comparing the first and second sidefiles (**paragraph 0261, lines 1-7**), and
- update means, responsive to the comparison, for updating writes stored at the second remote mirror means based upon the comparison of the first and second sidefiles (**paragraph 0261, lines 1-7**).

25. **With respect to claim 33**, Iwamura et al. disclose a computer-readable medium having code segments embodied thereon execution of which cause a machine to synchronize data for a redundant data storage arrangement according to the method of claim 1 (**see above paragraph 7**).

Claim Rejections - 35 USC § 103

26. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

27. **Claims 5 and 18** are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwamura et al. (US 2005/0038968) as applied to claims 1-4, 6, 13-17, 19 and 26-33 above (see paragraphs 7-25), and further in view of Frederick (US 6,912,483).

28. **With respect to claim 5**, Iwamura et al. disclose the data synchronization arrangement of claim 1 (see above paragraph 7), configuring the first (**CL1904 of Figs. 19 and 20; paragraph 0245**) and second (**DL1906 of Figs. 19 and 20; paragraph**

0245) sidefiles to store a fixed number of writes therein, respectively (**paragraph 0266, lines 5-8**). Iwamura et al. do not disclose the limitation further comprising adding a new write to the first and second sidefiles by overwriting the oldest write therein, respectively.

However, Frederick discloses the limitation further comprising adding a new write to the first and second sidefiles by overwriting the oldest write therein, respectively (**column 6, lines 54-55**).

Iwamura et al. and Frederick are analogous art because they are from the same field of endeavor, namely data logging.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the circular logging of Frederick with the data synchronization arrangement of Iwamura et al. The motivation for doing so would have been so that "each log... has a fixed size in memory" (**column 6, lines 52-53**).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine Frederick with Iwamura et al. for the benefit of a data synchronization arrangement with a circular log to obtain the invention as specified in claim 5.

29. **With respect to claim 18**, Iwamura et al. disclose the data synchronization arrangement of claim 13 (see above paragraph 12), wherein the first means (**170 of Figs. 1, 19 and 22; paragraph 0040, line 2**) and second (**180 of Figs. 1, 19 and 22; paragraph 0040, lines 2-3**) remote storage entities are configured to store a fixed number of writes therein, respectively (**paragraph 0266, lines 5-8**). Iwamura et al. also disclose the first (**CL1904 of Figs. 19 and 20; paragraph 0245**) and second (**DL1906**

of Figs. 19 and 20; paragraph 0245) sidefiles. Iwamura et al. do not disclose the limitation wherein the first and second remote storage entities are operable to add a new write to the first and second sidefiles by overwriting the oldest write therein, respectively.

However, Frederick discloses the limitation wherein the first and second remote storage entities are operable to add a new write to the first and second sidefiles by overwriting the oldest write therein, respectively **(column 6, lines 54-55)**.

Iwamura et al. and Frederick are analogous art because they are from the same field of endeavor, namely data logging.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the circular logging of Frederick with the data synchronization arrangement of Iwamura et al. The motivation for doing so would have been so that "each log... has a fixed size in memory" **(column 6, lines 52-53)**.

Therefore, it would have been obvious to a person of ordinary skill in the art to combine Frederick with Iwamura et al. for the benefit of a data synchronization arrangement with a circular log to obtain the invention as specified in claim 5.

30. **Claims 7-9 and 20-22** are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwamura et al. (US 2005/0038968) as applied to claims 1-4, 6, 13-17, 19 and 26-33 above (see paragraphs 7-25), and further in view of McDowell (US 6,260,125).

31. **With respect to claim 7**, Iwamura et al. disclose the data synchronization arrangement of claim 6 (see above paragraph 11). Iwamura et al. do not disclose the

limitation wherein the adaptive adjustment is based upon the writes that are stored in the second sidefile.

However, McDowell discloses the limitation wherein the adaptive adjustment is based upon the writes that are stored in the second sidefile (**column 8, lines 3-6**).

Iwamura et al. and McDowell are analogous art because they are from the same field of endeavor, namely logging of writes in a mirrored data system.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the log file adjustment of McDowell with the data synchronization arrangement of Iwamura et al. The motivation for doing so would have been "to keep the log file size manageable" (**column 8, line 3**).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine McDowell with Iwamura et al. for the benefit of a data synchronization arrangement with log file adjustment to obtain the invention as specified in claim 7.

32. **With respect to claim 8**, Iwamura et al. disclose the data synchronization arrangement of claim 6 (see above paragraph 11). Iwamura et al. do not disclose the limitation wherein the adaptive adjustment more particularly is based upon the write stored in the second sidefile which has the oldest contiguous sequence number.

However, McDowell discloses the limitation wherein the adaptive adjustment more particularly is based upon the write stored in the second sidefile which has the oldest contiguous sequence number (**column 8, lines 7-10**).

Iwamura et al. and McDowell are analogous art because they are from the same field of endeavor, namely logging of writes in a mirrored data system.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the log file adjustment of McDowell with the data synchronization arrangement of Iwamura et al. The motivation for doing so would have been "to keep the log file size manageable" (**column 8, line 3**).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine McDowell with Iwamura et al. for the benefit of a data synchronization arrangement with log file adjustment to obtain the invention as specified in claim 8.

33. **With respect to claim 9**, Iwamura et al. disclose the limitations further comprising:

- identifying at least some of the writes stored in the second sidefile (**DL1906 of Figs. 19 and 20**) (**paragraph 0236**); and then
- accordingly informing the first remote storage entity (**170 of Figs. 1 and 19; paragraph 0040, line 2**) regarding such identities (**paragraph 0236 indicates that a sequential ID may be substituted for time stamps; paragraphs 0252-0254 describe how time stamps are compared by host 271 of synchronous site 170 of Fig. 19, and the sequential IDs could be substituted for time stamps, so the IDs would be transmitted to the synchronous site**).

34. **With respect to claim 20**, Iwamura et al. disclose the data synchronization arrangement of claim 19 (see above paragraph 17). Iwamura et al. do not disclose the limitation wherein the adaptive adjustment is based upon the writes that are stored in the second sidefile.

However, McDowell discloses the limitation wherein the adaptive adjustment is based upon the writes that are stored in the second sidefile (**column 8, lines 3-6**).

Iwamura et al. and McDowell are analogous art because they are from the same field of endeavor, namely logging of writes in a mirrored data system.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the log file adjustment of McDowell with the data synchronization arrangement of Iwamura et al. The motivation for doing so would have been "to keep the log file size manageable" (**column 8, line 3**).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine McDowell with Iwamura et al. for the benefit of a data synchronization arrangement with log file adjustment to obtain the invention as specified in claim 20.

35. **With respect to claim 21**, Iwamura et al. disclose the data synchronization arrangement of claim 20 (see above paragraph 33). Iwamura et al. do not disclose the limitation wherein the adaptive adjustment more particularly is based upon the write stored in the second sidefile which has the newest contiguous sequence number

However, McDowell discloses the limitation wherein the adaptive adjustment more particularly is based upon the write stored in the second sidefile which has the oldest newest sequence number (**column 8, lines 7-10**).

Iwamura et al. and McDowell are analogous art because they are from the same field of endeavor, namely logging of writes in a mirrored data system.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the log file adjustment of McDowell with the data synchronization

arrangement of Iwamura et al. The motivation for doing so would have been “to keep the log file size manageable” (**column 8, line 3**).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine McDowell with Iwamura et al. for the benefit of a data synchronization arrangement with log file adjustment to obtain the invention as specified in claim 21.

36. **With respect to claim 22**, Iwamura et al. disclose the data synchronization arrangement of claim 20 (see above paragraph 34), wherein:

- the primary storage entity (**100 of Fig. 19, paragraph 0229, line 5**) is operable to identify at least some of the writes stored in the second sidefile (**DL1906 of Figs. 19 and 20**) (**paragraph 0236; the database 1907 of Fig. 19 creates the IDs, and is a component of the primary storage unit 100 of Fig. 19**); and then
- accordingly informing the first remote storage entity (**170 of Figs. 1 and 19; paragraph 0040, line 2**) regarding such identities (**paragraph 0236 indicates that a sequential ID may be substituted for time stamps; paragraphs 0252-0254 describe how time stamps are compared by host 271 of synchronous site 170 of Fig. 19, and the sequential IDs could be substituted for time stamps, so the IDs would be transmitted to the synchronous site**).

37. **Claims 10-12 and 23-25** are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwamura et al. (US 2005/0038968) as applied to claims 1-4, 6, 13-17, 19 and 26-33 above (see paragraphs 7-25), and further in view of Harter, Jr. (US 6,098,179).

38. **With respect to claim 10**, Iwamura et al. disclose the data synchronization arrangement of claim 1 (see above paragraph 7), and the first sidefile (**CL1904 of Figs. 19 and 20; paragraph 0245**) and the second remote storage entity (**180 of Figs. 1, 19 and 22; paragraph 0040, lines 2-3**). Iwamura et al. do not disclose the limitation further comprising: configuring the first sidefile to include a field that is used to track whether a write has been acknowledged by the second remote storage entity as having been received.

However, Harter, Jr. discloses the limitation further comprising: configuring the first sidefile to include a field that is used to track whether a write has been acknowledged by the second remote storage entity as having been received (**column 7, line 65 -- column 8, line 4**).

Iwamura et al. and Harter, Jr. are analogous art because they are from the same field of endeavor, namely data transmission between storage entities.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the acknowledgement field of Harter, Jr. with the data synchronization arrangement of Iwamura et al. The motivation for doing so would have been to communicate "an indication as to whether the responding node's PCI/MC adapter is in a hardware error state" (**column 8, lines 2-4**).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine Harter, Jr. with Iwamura et al. for the benefit of a data synchronization arrangement with an acknowledgement field to obtain the invention as specified in claim 10.

39. **With respect to claim 11**, Iwamura et al. disclose the data synchronization arrangement of claim 1 (see above paragraph 7) further comprising: providing a third sidefile via which writes received thereby are tracked (**AL 1902 of Figs. 19 and 20; paragraph 0234, lines 3-7**). Iwamura et al do not disclose the limitation further comprising: configuring the third sidefile to include a field that is used to track whether a write has been acknowledged by the second remote storage entity as having been received.

However, Harter, Jr. discloses the limitation further comprising: configuring the third sidefile to include a field that is used to track whether a write has been acknowledged by the second remote storage entity as having been received (**column 7, line 65 -- column 8, line 4**).

Iwamura et al. and Harter, Jr. are analogous art because they are from the same field of endeavor, namely data transmission between storage entities.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the acknowledgement field of Harter, Jr. with the data synchronization arrangement of Iwamura et al. The motivation for doing so would have been to communicate "an indication as to whether the responding node's PCI/MC adapter is in a hardware error state" (**column 8, lines 2-4**).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine Harter, Jr. with Iwamura et al. for the benefit of a data synchronization arrangement with an acknowledgement field to obtain the invention as specified in claim 11.

40. **With respect to claim 12**, Iwamura et al. disclose the data synchronization arrangement of claim 11 (see above paragraph 39) further comprising: configuring the third sidefile further to track whether a write-acknowledgement forwarded from the second remote storage entity has been acknowledged as having been received by the first remote storage entity (**paragraph 0270, a write completion message is stored in journal file system 2202 on the primary storage site 110 after a write to the asynchronous site 180**). Iwamura et al do not disclose the limitation further comprising: configuring the third sidefile further to include a field that is used to track whether a write-acknowledgement forwarded from the second remote storage entity has been acknowledged as having been received by the first remote storage entity.

However, Harter, Jr. discloses the limitation further comprising: configuring the third sidefile further to include a field that is used to track whether a write-acknowledgement forwarded from the second remote storage entity has been acknowledged as having been received by the first remote storage entity (**column 7, line 65 -- column 8, line 4**).

Iwamura et al. and Harter, Jr. are analogous art because they are from the same field of endeavor, namely data transmission between storage entities.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the acknowledgement field of Harter, Jr. with the data synchronization arrangement of Iwamura et al. The motivation for doing so would have been to communicate "an indication as to whether the responding node's PCI/MC adapter is in a hardware error state" (**column 8, lines 2-4**).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine Harter, Jr. with Iwamura et al. for the benefit of a data synchronization arrangement with an acknowledgement field to obtain the invention as specified in claim 12.

41. **With respect to claim 23**, Iwamura et al. disclose the data synchronization arrangement of claim 13 (see above paragraph 12), and the first sidefile (**CL1904 of Figs. 19 and 20; paragraph 0245**) and the second remote storage entity (**180 of Figs. 1, 19 and 22; paragraph 0040, lines 2-3**). Iwamura et al. do not disclose the limitation wherein the first sidefile includes a field that is used to track whether a write has been acknowledged by the second remote storage entity as having been received.

However, Harter, Jr. discloses the limitation wherein the first sidefile includes a field that is used to track whether a write has been acknowledged by the second remote storage entity as having been received (**column 7, line 65 -- column 8, line 4**).

Iwamura et al. and Harter, Jr. are analogous art because they are from the same field of endeavor, namely data transmission between storage entities.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the acknowledgement field of Harter, Jr. with the data synchronization arrangement of Iwamura et al. The motivation for doing so would have been to communicate "an indication as to whether the responding node's PCI/MC adapter is in a hardware error state" (**column 8, lines 2-4**).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine Harter, Jr. with Iwamura et al. for the benefit of a data synchronization

arrangement with an acknowledgement field to obtain the invention as specified in claim 23.

42. **With respect to claim 24**, Iwamura et al. disclose the data synchronization arrangement of claim 1 (see above paragraph 7) wherein: the primary storage entity includes a third sidefile to track writes received thereby (**AL 1902 of Figs. 19 and 20; paragraph 0234, lines 3-7**). Iwamura et al do not disclose the limitation wherein: the first sidefile including a field that is used to track whether a write has been acknowledged by the second remote storage entity as having been received.

However, Harter, Jr. discloses the limitation wherein: the first sidefile including a field that is used to track whether a write has been acknowledged by the second remote storage entity as having been received (**column 7, line 65 -- column 8, line 4**).

Iwamura et al. and Harter, Jr. are analogous art because they are from the same field of endeavor, namely data transmission between storage entities.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the acknowledgement field of Harter, Jr. with the data synchronization arrangement of Iwamura et al. The motivation for doing so would have been to communicate "an indication as to whether the responding node's PCI/MC adapter is in a hardware error state" (**column 8, lines 2-4**).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine Harter, Jr. with Iwamura et al. for the benefit of a data synchronization arrangement with an acknowledgement field to obtain the invention as specified in claim 24.

43. **With respect to claim 25**, Iwamura et al. disclose the data synchronization arrangement of claim 24 (see above paragraph 42) wherein the first sidefile further tracks whether a write-acknowledgement forwarded from the second remote storage entity has been acknowledged as having been received by the first remote storage entity (**paragraph 0270, a write completion message is stored in journal file system 2202 on the primary storage site 110 after a write to the asynchronous site 180**). Iwamura et al do not disclose the limitation wherein the first sidefile further includes a field that is used to track whether a write-acknowledgement forwarded from the second remote storage entity has been acknowledged as having been received by the first remote storage entity.

However, Harter, Jr. discloses the limitation wherein the first sidefile further includes a field that is used to track whether a write-acknowledgement forwarded from the second remote storage entity has been acknowledged as having been received by the first remote storage entity (**column 7, line 65 -- column 8, line 4**).

Iwamura et al. and Harter, Jr. are analogous art because they are from the same field of endeavor, namely data transmission between storage entities.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the acknowledgement field of Harter, Jr. with the data synchronization arrangement of Iwamura et al. The motivation for doing so would have been to communicate "an indication as to whether the responding node's PCI/MC adapter is in a hardware error state" (**column 8, lines 2-4**).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine Harter, Jr. with Iwamura et al. for the benefit of a data synchronization arrangement with an acknowledgement field to obtain the invention as specified in claim 25.

Conclusion

44. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Cochran et al. (US 2005/0193179) teach a mirroring system with multiple sidefiles.
- Cochran et al. (US 2005/0102553) teach a mirroring system with multiple sidefiles.
- Cochran et al. (US 2004/0230859) teach a mirroring system with multiple sidefiles.
- Cohn et al. (US 5,241,669) teach a mirroring system with a sidefile.
- Geiner et al. (US 6,842,825) teach a mirroring system with multiple sidefiles.
- Kern et al. (US 6,484,187) teach a mirroring system with a sidefile.

45. Any inquiry concerning this communication or earlier communications from the examiner should be directed to James Golden whose telephone number is 571-272-5628. The examiner can normally be reached on Monday-Friday, 8:30 AM - 5:30 PM.

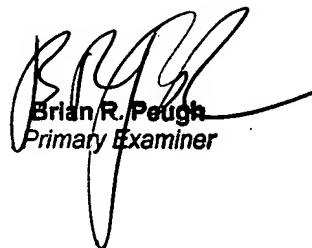
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald Sparks can be reached on 571-272-4201. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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Art Unit 2187



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Brian R. Peugh
Primary Examiner